

TABLE 2.—Free-air resultant winds (meters per second) based on pilot-balloon observations made near 5 a. m. (E. S. T.) during May 1936

[Wind from N=360°, E=90°, etc.]

| Altitude (m) m. s. l. | Albuquerque, N. Mex. (1,554 m) | | Atlanta, Ga. (309 m) | | Billings, Mont. (1,088 m) | | Boston, Mass. (15 m) | | Cheyenne, Wyo. (1,873 m) | | Chicago, Ill. (192 m) | | Cincinnati, Ohio (153 m) | | Detroit, Mich. (204 m) | | Fargo, N. Dak. (274 m) | | Houston, Tex. (21 m) | | Key West, Fla. (11 m) | | Medford, Oreg. (410 m) | | Murfrees- boro, Tenn. (180 m) | |
|--------------------------|--------------------------------------|----------|----------------------------|----------|---------------------------------|----------|----------------------------|----------|--------------------------------|----------|-----------------------------|----------|--------------------------------|----------|------------------------------|----------|------------------------------|----------|----------------------------|----------|--------------------------------|----------|------------------------------|----------|-------------------------------------|----------|
| | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity |
| Surface | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 500 | 47 | 1.6 | 13 | 0.5 | 275 | 2.6 | 266 | 2.4 | 284 | 2.7 | 179 | 1.3 | 58 | 0.4 | 254 | 1.7 | 172 | 1.1 | 85 | 2.0 | 90 | 2.7 | 287 | 0.1 | 10 | 0.4 |
| 1,000 | --- | --- | 119 | 1.6 | --- | --- | 283 | 7.0 | --- | --- | 223 | 5.7 | 197 | 1.7 | 271 | 4.5 | 215 | 4.3 | 134 | 6.3 | 99 | 5.0 | 290 | 0.4 | 159 | 2.5 |
| 1,500 | --- | --- | 129 | 2.8 | --- | --- | 284 | 7.0 | --- | --- | 249 | 5.4 | 282 | 3.7 | 278 | 6.1 | 257 | 4.7 | 134 | 5.4 | 107 | 5.0 | 284 | 1.1 | 196 | 3.7 |
| 2,000 | --- | --- | 119 | 1.6 | 231 | 4.2 | 282 | 9.0 | --- | --- | 269 | 5.9 | 273 | 5.6 | 281 | 6.7 | 270 | 4.4 | 137 | 3.2 | 97 | 3.3 | 140 | 0.7 | 217 | 3.3 |
| 2,500 | 175 | 1.2 | 147 | 1.6 | 244 | 4.5 | 279 | 9.4 | 273 | 3.7 | 279 | 6.6 | 270 | 6.9 | 284 | 7.8 | 291 | 4.9 | 149 | 1.9 | 87 | 2.2 | 149 | 1.6 | 241 | 3.1 |
| 3,000 | 225 | 2.6 | 136 | 2.6 | 260 | 4.6 | 285 | 10.9 | 270 | 4.4 | 293 | 6.7 | 270 | 7.2 | 297 | 8.1 | 307 | 4.0 | 142 | 0.8 | 108 | 1.3 | 195 | 2.7 | 266 | 2.5 |
| 3,500 | 249 | 3.5 | 177 | 2.2 | 267 | 4.8 | 283 | 10.8 | 264 | 3.0 | 297 | 6.7 | 286 | 8.4 | 298 | 10.0 | 255 | 6.2 | 147 | 0.8 | 65 | 0.4 | 204 | 2.5 | 257 | 1.5 |
| 4,000 | 266 | 4.2 | 200 | 2.6 | 275 | 5.0 | 285 | 10.1 | 272 | 3.4 | 307 | 14.6 | 286 | 11.6 | 286 | 12.1 | 315 | 5.3 | 40 | 1.0 | 253 | 2.4 | 227 | 3.5 | 206 | 2.8 |
| 5,000 | 255 | 3.7 | 187 | 2.0 | 277 | 5.3 | 295 | 11.1 | 304 | 5.5 | 301 | 13.2 | --- | --- | 284 | 11.8 | --- | --- | 16 | 1.9 | --- | --- | 260 | 5.4 | 302 | 1.4 |

| Altitude (m) m. s. l. | Newark, N. J. (14 m) | | Oakland, Calif. (8 m) | | Oklahoma City, Okla. (402 m) | | Omaha, Nebr. (306 m) | | Pearl Har- bor, Terri- tory of Ha- waii (68 m) | | Pensacola, Fla. ¹ (24 m) | | St. Louis Mo. (170 m) | | Salt Lake City, Utah (1,294 m) | | San Diego, Calif. (15 m) | | Sanit Ste. Marie, Mich. (198 m) | | Seattle, Wash. (14 m) | | Spokane, Wash. (603 m) | | Washing- ton, D. C. (10 m) | |
|--------------------------|----------------------------|----------|-----------------------------|----------|------------------------------------|----------|----------------------------|----------|---|----------|---|----------|-----------------------------|----------|--------------------------------------|----------|--------------------------------|----------|--|----------|-----------------------------|----------|------------------------------|----------|----------------------------------|----------|
| | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity | Direction | Velocity |
| Surface | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • | • |
| 500 | 292 | 1.3 | 226 | 0.5 | 166 | 2.7 | 146 | 1.5 | 57 | 5.0 | 78 | 4.1 | 183 | 1.1 | 155 | 3.1 | 42 | 0.6 | 29 | 0.4 | 163 | 1.3 | 148 | 0.9 | 304 | 0.5 |
| 1,000 | 302 | 6.8 | 213 | 2.3 | 153 | 3.6 | 174 | 3.5 | 69 | 8.2 | 90 | 6.7 | 188 | 4.8 | --- | --- | 324 | 0.9 | 343 | 1.0 | 178 | 0.8 | 206 | 2.9 | 283 | 5.0 |
| 1,500 | 305 | 5.8 | 346 | 4.3 | 175 | 8.6 | 208 | 6.9 | 72 | 9.1 | 110 | 5.0 | 231 | 4.7 | --- | --- | 344 | 3.6 | 290 | 5.9 | 308 | 1.5 | --- | --- | 292 | 4.9 |
| 2,000 | 287 | 6.8 | 332 | 3.2 | 186 | 4.9 | 226 | 7.2 | 84 | 7.8 | 132 | 3.5 | 238 | 4.0 | 160 | 3.7 | 331 | 4.1 | 284 | 6.2 | 244 | 1.6 | 224 | 3.4 | 293 | 5.1 |
| 2,500 | 277 | 8.2 | 321 | 3.0 | 194 | 2.8 | 231 | 6.6 | --- | --- | 126 | 2.7 | 247 | 3.3 | 176 | 3.0 | 322 | 2.9 | 313 | 10.2 | 245 | 3.5 | 216 | 2.1 | 294 | 7.3 |
| 3,000 | 281 | 9.4 | 326 | 4.2 | 210 | 2.2 | 245 | 3.5 | --- | --- | 139 | 1.8 | 309 | 2.8 | 208 | 2.0 | 344 | 2.9 | 318 | 11.1 | 245 | 5.6 | 213 | 2.7 | 295 | 8.3 |
| 4,000 | 286 | 8.0 | 307 | 3.3 | 238 | 1.5 | 306 | 3.4 | --- | --- | 115 | 2.1 | 318 | 3.8 | 218 | 2.3 | 341 | 4.4 | 322 | 13.1 | 249 | 7.3 | 228 | 4.3 | 298 | 9.4 |
| 5,000 | --- | --- | 273 | 8.7 | 94 | 0.5 | 339 | 2.9 | --- | --- | 31 | 1.1 | --- | --- | 225 | 4.7 | 317 | 6.5 | 329 | 15.2 | 241 | 9.8 | 243 | 5.8 | 291 | 10.0 |

¹ Navy stations.

RIVERS AND FLOODS

[River and Flood Division, MONTROSE W. HAYES in charge]

By W. J. MOXOM

Floods did not occur during May in any of the major streams of the United States, although stages in the lower Mississippi River were fairly high during the first part of the month because of the discharge from the Ohio River flood of March and April. Light to moderate floods occurred in widely separated sections in several of the smaller streams. The most severe was in southeastern Colorado, where torrential rain on May 30 caused a rapid rise to above flood stage in the Arkansas River in the vicinity of Lamar and Holly, Colo., including the tributaries both north and south of the main stream. Newspaper and other accounts report the loss of six lives in southeastern Colorado and the adjacent area in western Kansas. Reported estimates of property losses in this vicinity total nearly \$500,000. Estimated flood losses elsewhere during May amount to \$34,300.

The following remarks are compiled from reports rendered by the various district centers:

Columbia, S. C.—The Santee River at Rimini and Ferguson, S. C., was slightly above flood stage during the first few days of the month; this was a continuation of the April flood. No flood losses occurred in May.

Meridian, Miss.—Moderately heavy to heavy rains occurred over the Meridian river district during the last 3 days of April, causing a rapid rise in the rivers. Prior to these rains the streams were all seasonably low, indicating a dry soil, with the swamps relatively dry. This condition accounts for the fact that only a light flood occurred in the central and lower Pearl watersheds, while flood stages were not reached in the Pascagoula watershed. Estimated flood losses in the Pearl River system from all sources were \$10,250.

La Crosse, Wis.—For the third time this season the upper Mississippi was near flood stage. The crest passed La Crosse at 11 a. m. of the 13th, with a stage of 10.83. The only station at which flood stage was reached was Durand, Wis., on the Chippewa River, where a crest of 11.3 feet, 0.3 foot above flood level, occurred on the 9th. The high water during May was caused by frequent heavy rains in the headwaters during the first week of the month. After the 15th the rivers began to fall at a rapid rate. Flood losses during the month were very light.

Topeka, Kans.—The only overflow in the district during May was a slight one of the upper Solomon River, which reached a crest of 22.2 feet (4.2 above flood stage) at Beloit, Kans., on the 12th. The total estimated damage was \$1,300, the greater part of which was to prospective crops.

Concordia, Kans.—Slight flooding occurred during the month in the lower Republican River. Estimated losses amounted to about \$500 to growing crops, mostly in the vicinity of Junction City, Kans.

Indianapolis, Ind.—Flood stages were passed on the Wabash River at La Fayette, Covington, and Terre Haute, Ind. While there was a considerable rise in the river above La Fayette no flooding occurred in that reach. Below Terre Haute the flood flattened rapidly, owing to the light rainfall over the lower reach, and stages were considerably short of flood below Terre Haute. Losses were negligible.

Wichita, Kans.—There was flooding of lowlands between Syracuse and Dodge City, owing to heavy rains in eastern Colorado and western Kansas during the last few days of May. Damages were not reported.

Shreveport, La.—Moderate flooding occurred in the Sulphur River in northeast Texas, with the estimated damages amounting to about \$12,000, the greater part to growing crops.

Dallas, Tex.—There was a light flood in the Trinity River in the vicinity of Dallas, Tex. Some growing crops were overflowed, but resulting losses were very light.

San Antonio, Tex.—Moderately heavy flooding occurred in the Colorado and Guadalupe Rivers in Texas, and stages continued high into June. An estimate of flood losses is not available at this date.

Albuquerque, N. Mex.—A flash flood occurred at Fort Sumner, N. Mex., near the headwaters of the Pecos River, on the night of the 28–29th. The river remained above flood stage slightly less than 6 hours. Dykes and bridges at the Alamegordo Dam above Fort Sumner were damaged approximately \$10,000 by the flood.

Brownsville, Tex.—The Rio Grande reached flood stage at Brownsville on one day, but without overflow anywhere except through a few breaks of little consequence.

Denver, Colo.—Flood stages were slightly exceeded at Eagle, Carbondale, and Delta, Colo., on tributaries of the Colorado River, several times during the month. Losses from these floods were negligible.

Heavy local rainfall occurred on May 30 in southeastern Colorado causing a rapid rise to above flood stage in the Arkansas River in the vicinity of Lamar to Holly, Colo., and in the tributaries both to the north and south of the main stream. From newspaper and other accounts it appears that six persons lost their lives in these floods in southeastern Colorado and the adjacent area in western Kansas. Property losses at Lamar, Carlton, and Holly, and their immediate vicinities, amounted to approximately \$500,000.

Table of flood stages during May 1936

[All dates in May unless otherwise specified]

| River and station | Flood stage | Above flood stages—dates | | Crest | |
|--|-------------|--------------------------|-----|-------------|------|
| | | From— | To— | Stage | Date |
| EAST GULF OF MEXICO DRAINAGE | | | | | |
| Pearl: | <i>Feet</i> | | | <i>Feet</i> | |
| Jackson, Miss..... | 18 | Apr. 30 | 6 | 21.9 | 3 |
| Monticello, Miss..... | 15 | Apr. 30 | 4 | 17.9 | 3 |
| Columbia, Miss..... | 17 | 5 | 5 | 17.0 | 5 |
| Pearl River, La..... | 12 | 6 | 13 | 14.4 | 9 |
| MISSISSIPPI SYSTEM | | | | | |
| Upper Mississippi Basin | | | | | |
| Chippewa: Durand, Wis..... | 11 | 9 | 9 | 11.3 | 9 |
| Wisconsin: Knowlton, Wis..... | 12 | 6 | 8 | 15.7 | 7 |
| Missouri Basin | | | | | |
| Solomon: Beloit, Kans..... | 18 | 11 | 12 | 22.2 | 12 |
| Republican: Clay Center, Kans..... | 12 | 11 | 12 | 13.3 | 11 |
| Ohio Basin | | | | | |
| West Fork of White: Anderson, Ind..... | 8 | 2 | 6 | 10.4 | 3 |
| Wasbush: | | | | | |
| La Fayette, Ind..... | 11 | 3 | 5 | 15.4 | 4 |
| Covington, Ind..... | 16 | 3 | 6 | 18.95 | 5 |
| Terre Haute, Ind..... | 14 | 5 | 8 | 15.1 | 7 |

Table of flood stages during May 1936—Continued

[All dates in May unless otherwise specified]

| River and station | Flood stage | Above flood stages—dates | | Crest | |
|---|-------------|--------------------------|-----|-------|--------|
| | | From— | To— | Stage | Date |
| MISSISSIPPI SYSTEM—continued | | | | | |
| Arkansas Basin | | | | | |
| North Canadian: | Feet | | | Feet | |
| Woodward, Okla..... | 5 | 25 | 26 | 5.5 | 25, 26 |
| | | 28 | 31 | 6.0 | 29, 30 |
| Canton, Okla..... | 6 | 26 | 26 | 6.0 | 26 |
| | | 30 | (1) | 6.6 | 31 |
| Yukon, Okla..... | 8 | 12 | 13 | 8.6 | 12 |
| | | 27 | (1) | 9.9 | 31 |
| Arkansas: Lamar, Colo..... | 8 | 30 | 30 | 9.0 | 30 |
| Red Basin | | | | | |
| Sulphur: | | | | | |
| Ringo Crossing, Tex..... | 20 | 9 | 13 | 23.4 | 10 |
| Naples, Tex..... | 22 | 14 | 19 | 26.0 | 15 |
| Lower Mississippi Basin | | | | | |
| Mississippi: Natchez, Miss..... | 46 | Apr. 30 | 3 | 46.1 | 1-3 |
| Atchafalaya Basin | | | | | |
| Atchafalaya: Atchafalaya, La..... | 22 | Apr. 21 | 12 | 23.1 | 4-7 |
| WEST GULF OF MEXICO DRAINAGE | | | | | |
| Trinity: Dallas, Tex..... | 28 | 29 | 30 | 29.1 | 29 |
| Colorado: | | | | | |
| Columbus, Tex..... | 24 | 24 | 29 | 33.0 | 25 |
| Wharton, Tex..... | 26 | 25 | (1) | 36.6 | 27 |
| Guadalupe: | | | | | |
| Gonzales, Tex..... | 20 | 26 | 26 | 20.8 | 26 |
| | | 28 | 29 | 21.8 | 29 |
| Victoria, Tex..... | 21 | 24 | (1) | 29.6 | 25 |
| Pecos: Fort Sumner, N. Mex..... | 5 | 28 | 29 | 5.9 | 29 |
| Rio Grande: | | | | | |
| Espanola, N. Mex..... | 7 | 5 | 8 | 7.2 | 8 |
| Brownsville, Tex..... | 18 | 12 | 12 | 18.1 | 12 |
| GULF OF CALIFORNIA DRAINAGE | | | | | |
| Colorado Basin | | | | | |
| Eagle: Eagle, Colo..... | 5 | 21 | 21 | 5.0 | 21 |
| | | 26 | 27 | 5.1 | 26 |
| | | 30 | (1) | 5.3 | 31 |
| Roaring Fork of Colorado: Carbondale, Colo..... | 5 | 16 | (1) | 6.2 | 30 |
| | | 4 | 7 | 10.6 | 6 |
| Gunnison: Delta, Colo..... | 9 | 15 | 22 | 9.7 | 17, 18 |
| PACIFIC SLOPE DRAINAGE | | | | | |
| Columbia Basin | | | | | |
| Clearwater: Kamiah, Idaho..... | 12 | 3 | 6 | 13.6 | 4 |
| | | 11 | 18 | 15.2 | 15 |
| Willamette: Portland, Oreg..... | 18 | 16 | 24 | 19.4 | 18 |
| Columbia: Vancouver, Wash..... | 15 | 6 | (1) | 20.0 | 18 |

1 Continued into June.

WEATHER ON THE ATLANTIC AND PACIFIC OCEANS

[The Marine Division, I. R. TANNEHILL in charge]

NORTH ATLANTIC OCEAN, MAY 1936

By H. C. HUNTER

Atmospheric pressure.—Pressure was mostly higher than normal, especially over the northern British Isles and adjacent waters. Of the daily values secured from Lerwick, Shetland Islands, only those of the last 2 days were lower than the normal for May at that station. Over the southwestern part of the ocean, however, the pressure averaged less than normal.

The extremes of pressure found from vessel data are 30.64 and 29.17 inches. The higher reading was noted 300 miles to south-southeastward of Nantucket on the morning of the 23d, by the British motorship *Silverbeech*. The lower mark was recorded on the British motor tanker *San Alvaro*, at noon of the 14th, when the vessel was 350 miles west of Valencia, Ireland. Table 1 indicates that 2 days before the *San Alvaro's* reading the pressure at Reykjavik, Iceland, was almost a quarter of an inch lower, namely 28.94 inches.

TABLE 1.—Averages, departures, and extremes of atmospheric pressure (sea level) at selected stations for the North Atlantic Ocean and its shores, May 1936

| Stations | Average pressure | Departure | Highest | Date | Lowest | Date |
|--------------------------------|------------------|-------------|---------------|--------|---------------|--------|
| | <i>Inches</i> | <i>Inch</i> | <i>Inches</i> | | <i>Inches</i> | |
| Julianehaab, Greenland..... | 29.76 | | 30.43 | 27, 28 | 29.22 | 2, 3 |
| Reykjavik, Iceland..... | 29.96 | +0.04 | 30.54 | 27 | 28.94 | 12 |
| Lerwick, Shetland Islands..... | 30.17 | +0.37 | 30.40 | 4 | 29.76 | 30 |
| Valencia, Ireland..... | 30.06 | +0.11 | 30.37 | 1 | 29.68 | 5 |
| Lisbon, Portugal..... | 29.96 | —0.01 | 30.09 | 10, 28 | 29.73 | 19 |
| Madeira..... | 30.04 | +0.03 | 30.16 | 17 | 29.90 | 3 |
| Horta, Azores..... | 30.24 | +0.08 | 30.43 | 16, 17 | 29.96 | 27 |
| Belle Isle, Newfoundland..... | 29.92 | +0.03 | 30.34 | 4 | 29.64 | 18 |
| Halifax, Nova Scotia..... | 29.99 | +0.02 | 30.46 | 22 | 29.50 | 28, 29 |
| Nantucket..... | 30.01 | +0.02 | 30.49 | 22 | 29.44 | 28 |
| Hatteras..... | 30.06 | +0.05 | 30.50 | 22 | 29.65 | 28 |
| Bermuda..... | 30.06 | —0.05 | 30.28 | 21, 23 | 29.78 | 31 |
| Turks Island..... | 29.93 | —0.07 | 29.99 | 4 | 29.84 | 21, 22 |
| Key West..... | 29.94 | —0.03 | 30.06 | 1 | 29.71 | 28 |
| New Orleans..... | 29.99 | +0.02 | 30.18 | 22 | 29.65 | 28 |

NOTE.—All data based on a. m. observations only, with departures compiled from best available normals related to time of observation, except Hatteras, Key West, Nantucket, and New Orleans, which are 24-hour corrected means.